

## SOME CYCLOPOID AND HARPACTICOID COPEPODS FROM COLOMBIA, INCLUDING DESCRIPTIONS OF THREE NEW SPECIES

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*Abstract.*—The cyclopoid copepods *Paracyclops andinus* Kiefer, *P. novenarius*, new species, *Eucyclops serrulatus* (Fischer), *Mesocyclops aspericornis* (Daday), and the harpacticoid copepods *Elaphoidella suarezi*, new species, and *E. radkei*, new species, are recorded from outdoor artificial cultures of *Aedes aegypti* in Colombia. Descriptions of *P. novenarius*, *E. suarezi* and *E. radkei* are furnished.

Copepods collected from artificial containers in the municipalities of Anapoima and Agua de Dios (Cundinamarca) and Buenaventura (Valle), Colombia, in 1983 and 1985 were sent to me for determination by Dr. Marco F. Suarez of the Servicio Nacional de Erradicación de la Malaria, Bogotá. These outdoor artificial containers, used to rear larvae of *Aedes aegypti*, included asbestos-cement tanks (capacity 250 l), metal drums (200 l) and tires (4 l). Water was supplied to the containers from larger rainwater cisterns. Several species of cyclopoid and harpacticoid copepods were present in the containers. The 1983 finding of *Mesocyclops aspericornis* was reported by Suarez et al. (1984); all records are summarized below and the new species are described.

Locality and date	Species recorded
Anapoima, Cundinamarca:	
8 Nov. 1983	<i>Mesocyclops aspericornis</i> (Daday), 18 ♀
Agua de Dios, Cundinamarca:	
20 Aug 1985	<i>Eucyclops serrulatus</i> (Fischer), 15 ♀, 2 ♂
	<i>M. aspericornis</i> , 1 ♀
24 Sep 1985	<i>E. serrulatus</i> , 2 ♀
	<i>M. aspericornis</i> , 2 ♀, 1 ♂

Buenaventura, Valle:

29 Aug 1985	<i>Paracyclops andinus</i> Kiefer, 1 copepodite V ♂
	<i>Elaphoidella suarezi</i> , new species, 16 ♀
5 Sep 1985	<i>Paracyclops novenarius</i> , new species, 12 ♀, 10 ♂, 7 copepodites
18 Sep 1985	<i>Paracyclops novenarius</i> , 1 ♀, 4 copepodites
	<i>Elaphoidella radkei</i> , new species, 1 ♂

*Paracyclops novenarius*, new species  
Figs. 1-20

*Material.*—1 ♀, holotype, National Museum of Natural History, USNM 231096, 5 Sep 1985. Paratypes: 1 ♀, dissected on 1 slide, USNM 231097, 5 Sep 1985; 1 ♂, dissected on 1 slide, USNM 231098, 5 Sep 1985; 10 ♀, 9 ♂, 7 copepodites, USNM 231099, 5 Sep 1985; 1 ♀, 4 copepodites, USNM 231100, 18 Sep 1985; all from Buenaventura, Valle, Colombia. All undisseminated specimens alcohol-preserved.

*Description.*—Female: Length of holotype excluding caudal setae 0.67 mm; range of lengths of 11 paratypes 0.57-0.88 mm (median = 0.63 mm). Prosoma (Fig. 1) depressed; posterior margins of 2 anterior pro-

somal somites smooth, posterolateral margins of 2 posterior prosomal somites with hairs. Dorsolateral margin of first urosomal somite with spines, remaining urosomal somites with toothed hyaline membranes on posterior margins and few rows of fine spinules; posterior margin of anal somite with spinules. Genital segment (Figs. 2, 3) slightly expanded anteriorly and tapering posteriorly, broader than long; shape of seminal receptacle normal for genus. Caudal rami (Fig. 2) about  $4\times$  longer than broad, slightly divergent, separated at anal somite by a distance slightly less than breadth of ramus. Length of lateral seta about equal to width of ramus; length of dorsal seta about  $\frac{3}{4}$  length of ramus. Ratios of lengths of inner to outer apical setae 1:6.8:3.5:0.7. Medial apical setae set with fine setules proximally, grading to coarser setules distally.

Antennule (Figs. 4–7) of 9 articles in most specimens; article 4 with partial suture on anterodorsal surface. Article 6 with 2 setae and 1 narrow esthetasc. In one female, articles 3 and 4 of the right antennule are fused posteriorly and divided anteriorly (Fig. 6); while in the left antennule (Fig. 7) these articles are distinct posteriorly, article 3 appearing telescoped under article 2 anteriorly. Antenna, labrum and mouthparts as in Figs. 8–12. Swimming legs 1–4 (Figs. 13–16) each with rami of 3 articles and spine formula 3,4,4,3. Terminal article of endopod of leg 4,  $1.5\times$  longer than broad; inner apical spine  $2.1\times$  longer than outer. Basal lamellae of legs 1–3 each with crescentic row of fine spinules on each side of anterior surface and long hairs on margins; lamella of leg 4 with short hairs near margin.

Medial spine of leg 5 (Fig. 3) reaching midlength of genital segment when depressed. Ratios of lengths of medial to lateral spine and setae of leg 5, 1:1.5:1.2. Leg 6 (Fig. 2) consisting of 1 seta and 1 spinule inserted somewhat dorsally.

Male: Lengths of 10 specimens 0.54–0.64 mm (median = 0.60 mm). Ornamentation

of somites (Figs. 17, 18) similar to female. Caudal rami (Fig. 19) about  $2.7\times$  longer than broad; setae similar to those of female. Antennules geniculate (Fig. 20). Lateral seta of leg 5 (Fig. 18) long, slender; medial spine of leg 6 not reaching posterior margin of next somite; middle seta spiniform, short and stout.

*Etymology.*—From Latin “consisting of nine,” to describe the number of articles in the antennule.

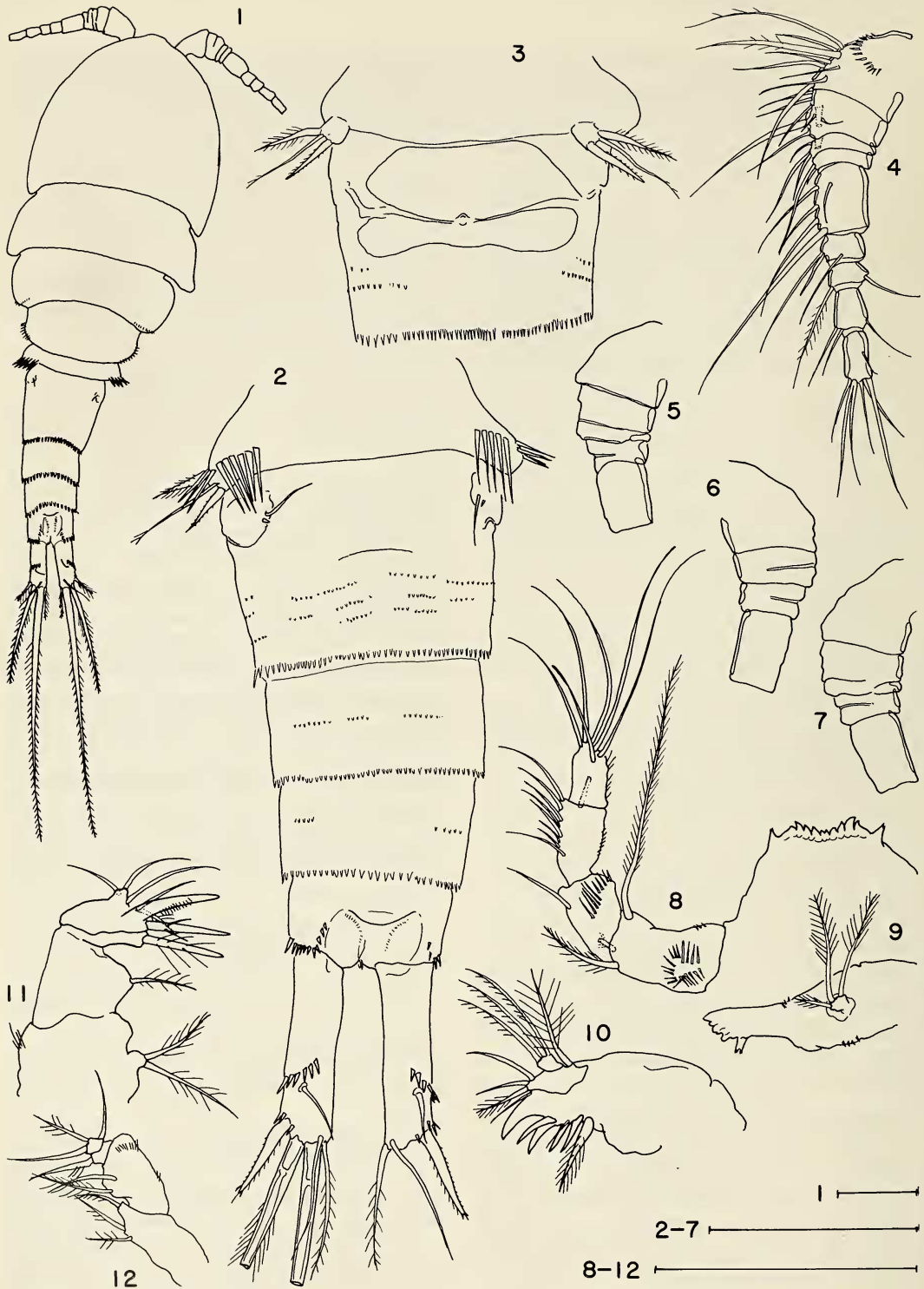
*Remarks.*—Species of the genus *Paracyclops*, particularly *P. fimbriatus* are notoriously variable in such features as the proportions of the caudal rami and of the terminal article of the endopod of leg 4 (Gurney 1933, Lindberg 1958). However, to my knowledge no population with antennules of 9 articles has been found; all other species in South America possess antennules of 8 articles (Lindberg 1958, Reid 1985). *Paracyclops novenarius* otherwise keys to *P. fimbriatus chiltoni* in the keys of Lindberg (1958) and Reid (1985), but differs in that the inner apical seta on the caudal ramus is relatively longer than that of *P. f. chiltoni*; the basal lamella of leg 4 lacks spinules on its anterior surface; and in the male, the medial spine of leg 6 does not reach the posterior margin of the succeeding somite.

*Elaphoidella suarezi*, new species

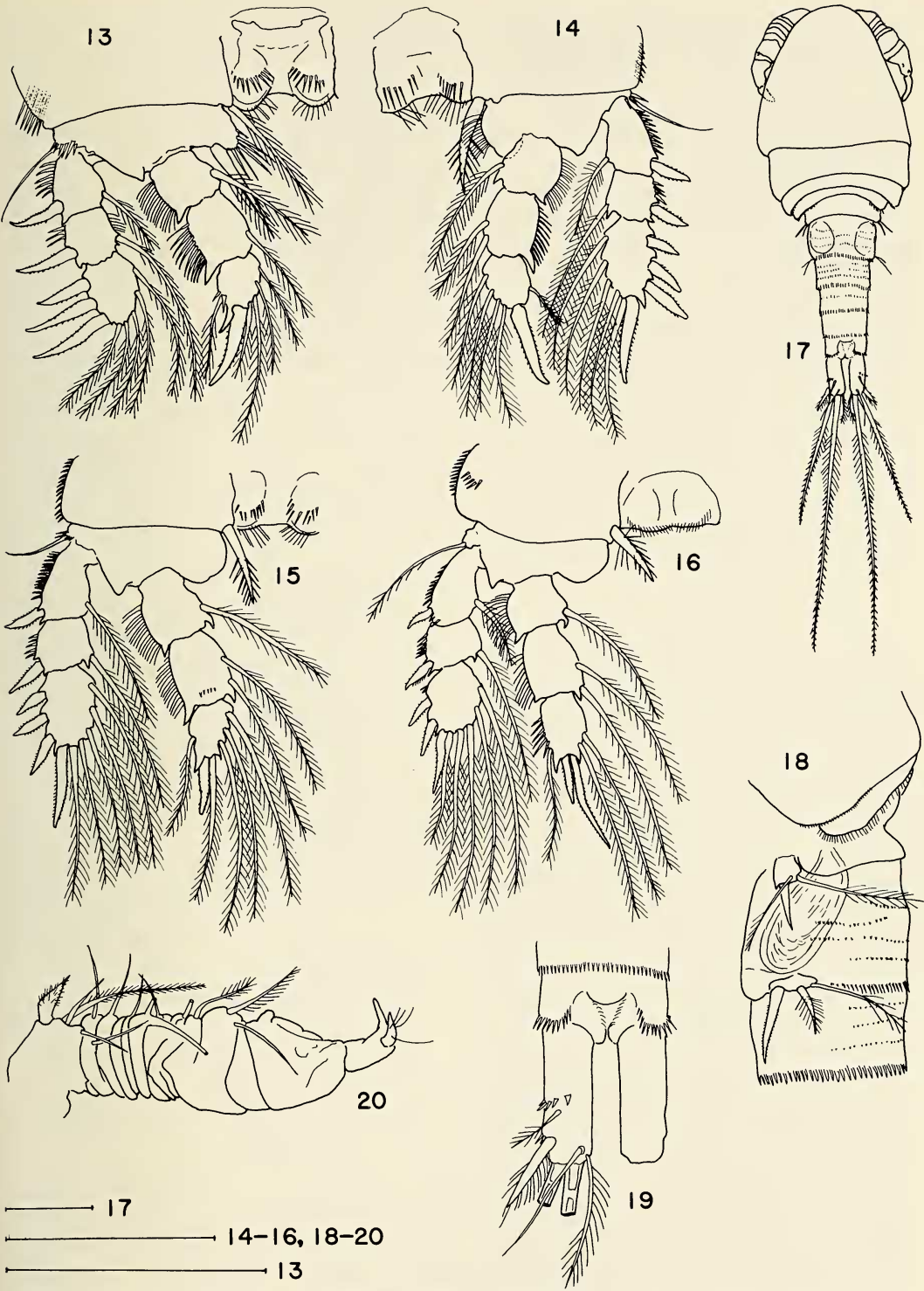
Figs. 21–33

*Material.*—1 ♀, holotype, USNM 231093, partly dissected on 1 slide. Paratypes: 15 ♀, USNM 231094, alcohol-preserved; all from Buenaventura, Valle, Colombia, 29 Aug 1985.

*Description.*—Female: Length of holotype 0.37 mm; range of lengths of 10 paratypes 0.35–0.41 mm (median = 0.38 mm). Prosomal and urosomal somites with lateral rows of tiny hairs and toothed posterior margins. Genital segment (Figs. 21, 22) with posterolateral row of 8 large spinules on each side and discontinuous posterodorsal and

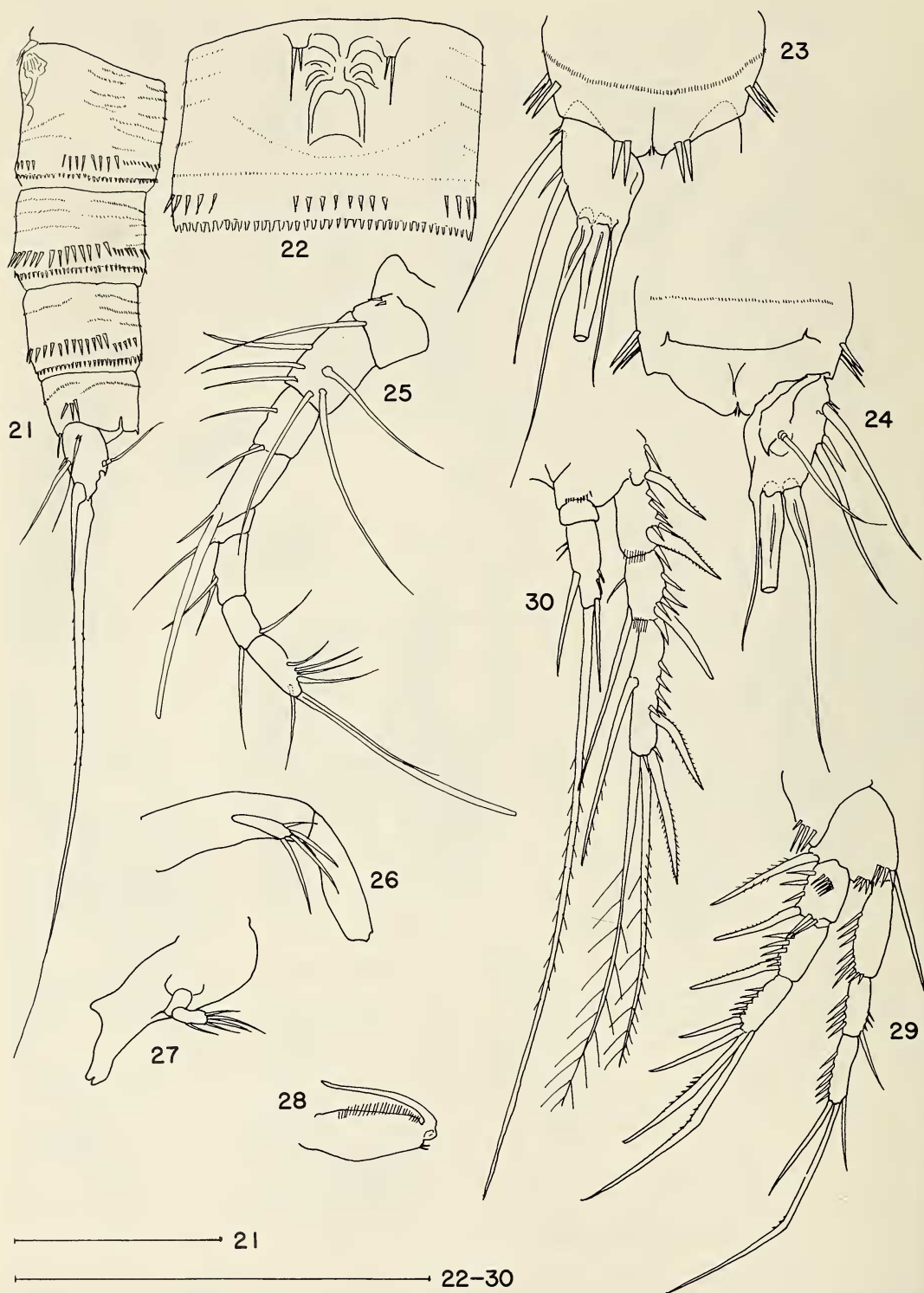


Figs. 1-12. *Paracyclops novenarius*, female: 1, Habitus; 2, Urosome, dorsal; 3, Genital segment, ventral; 4, Right antennule, ventral; 5, Left antennule articles 1-5, dorsal; 6, Right antennule articles 1-4, dorsal, of a second female; 7, Left antennule articles 1-5, ventral, of same female; 8, Antenna and labrum; 9, Mandible; 10, Maxillula; 11, Maxilla; 12, Maxilliped. Scales = 100  $\mu$ m.



Figs. 13-16. *Paracyclops novenarius*, female: 13, Leg 1; 14, Leg 2; 15, Leg 3; 16, Leg 4.  
 Figs. 17-20. *P. novenarius*, male: 17, Habitus; 18, Legs 5 and 6; 19, Caudal rami, dorsal; 20, Antennule.  
 Scales = 100  $\mu$ m.





Figs. 21–30. *Elaphoidella suarezi*, female: 21, Urosome, lateral; 22, Genital segment, ventral; 23, Anal somite and caudal ramus, ventral; 24, Anal somite and caudal ramus, dorsal; 25, Antennule and rostrum; 26, Antenna (setation omitted) and exopod; 27, Mandible; 28, Maxilliped; 29, Leg 1; 30, Leg 2. Scales = 100  $\mu$ m.

posteroventral rows of smaller spinules. Genital field extending to midlength of segment. Urosomal somites 2–3 each with row of large spinules ventrally and laterally and smaller spinules dorsally along posterior margins. Anal somite with group of 3 long spinules on each side and 2 long spinules extending posteroventrally over each caudal ramus (Figs. 21, 23). Operculum smooth, slightly convex (Figs. 21, 24). Caudal rami about  $1.5 \times$  longer than broad, with dorsal keel ending in posteriorly directed “tooth” at midlength of ramus and lateral to base of tooth bearing 1 seta with 2 basal articulations. Inner margin of each ramus smooth; outer margin with 2 setae and some spines. Middle apical seta about  $1.3 \times$  longer than urosome; outer apical seta nearly twice as long as inner apical seta, each of these setae swollen at base.

Rostrum (Fig. 25) reaching distal margin of antennule article 1. Antennule (Fig. 25) of 8 articles, articles 4 and 8 each with 1 long esthetasc. Antenna (Fig. 26) with allobasis; single article of exopod bearing 4 setae. Remaining mouthparts not completely dissected; exopod of mandible of 1 article (Fig. 27); maxilliped prehensile (Fig. 8).

Swimming legs 1–4 (Figs. 29–32) each with exopod of 3 articles; endopod of leg 1 of 3 articles, endopods of remaining legs each of 2 articles. Setation formula for major armature as follows:

Leg 1	basis 1-1	exp 0-1; 0-1; 1,2,1
		enp 0-0; 1-0; 1,2,0
Leg 2	basis 0-1	exp 0-1; 1-1; 1,2,2
		enp 0-0; 1,1,1
Leg 3	basis 0-1	exp 0-1; 1-1; 2,2,2
		enp 0-0; 2,2,1
Leg 4	basis 0-1	exp 0-1; 1-1; 2,2,2
		enp 0-0; 1,1,1

Leg 5 (Fig. 33) with inner expansion of basipod reaching past midlength of exopod and bearing 4 setae of which next innermost is longest. Oval exopod with 4 setae of which innermost is longest.

*Etymology*.—Named in honor of the collector, Dr. Marco E. Suarez.

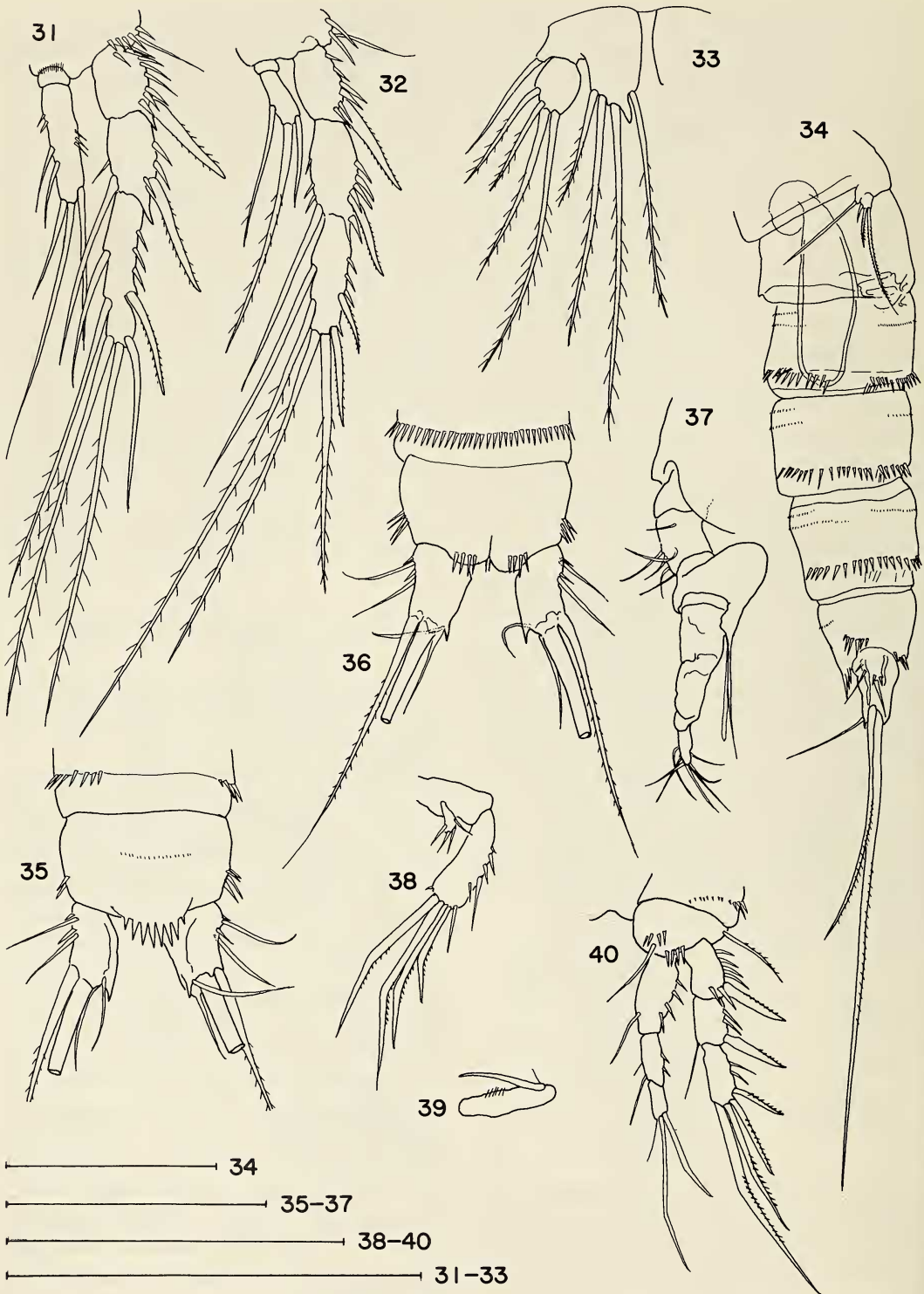
*Remarks*.—*Elaphoidella suarezi* is clearly a member of *Elaphoidella* Group VIII of Lang (1948), but differs from other members of this group recorded from the neotropics in possessing both an unarmed operculum and only two ventral spines on the anal somite above each caudal ramus (Table 1). Among species lacking teeth on the operculum, *E. humboldti* is known only from male specimens, but males of this species have five ventral spines above each caudal ramus, and the operculum is fringed with fine hairs (Löffler 1963). Chappuis (1928) described *E. malayica* as possessing four to seven spinules on each side of the anal somite above the caudal ramus; *E. malayica* is further distinguished by caudal rami which are quadrate in dorsal view and the possession of a short seta on the inner surface of the proximal article of the endopod of leg 3.

*Elaphoidella radkei*, new species  
Figs. 34–44

*Material*.—1 ♂, holotype, USNM 231095, alcohol-preserved; from Buenaventura, Valle, Colombia, 18 Sep 1985.

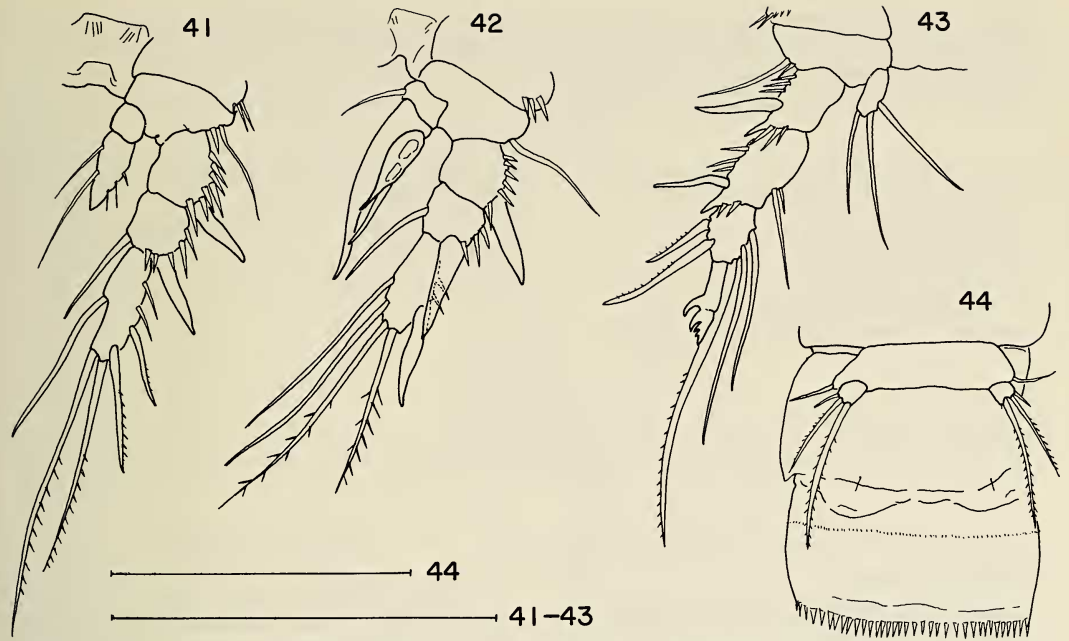
*Description*.—Male: Length 0.51 mm. Prosomal somites unornamented; urosomal somites 2–4 (Fig. 34) each with few dorsal and ventral rows of tiny hairs and row of spinules along posterior lateral and ventral margins, each spinule row discontinuous dorsally. Anal somite (Figs. 34–36) with row of 6 spinules on each side and 4 ventral spinules extending over each caudal ramus; operculum convex, with 8 teeth of which 2 outermost are shortest. Caudal rami about  $1.5 \times$  longer than broad, with dorsal keel extending past end of ramus and ending in posteriorly directed tooth; 1 seta inserted lateral to base of tooth. Inner margins of rami smooth; outer margins each with 2 setae and few spinules. Middle apical seta about  $1.2 \times$  longer than urosome; outer apical seta about  $3.7 \times$  longer than slender inner apical seta.

Rostrum (Fig. 37) about half length of article 1 of antennule; antennule geniculate,



Figs. 31-33. *Elaphoidella suarezi*, female: 31, Leg 3; 32, Leg 4; 33, Leg 5.

Figs. 34-40. *E. radkei*, male: 34, Urosome, lateral; 35, Anal somite and caudal rami, dorsal; 36, Anal somite and caudal rami, ventral; 37, Antennule; 38, Antenna; 39, Maxilliped; 40, Leg 1. Scales = 100  $\mu$ m.



Figs. 41-44. *Elaphoidella radkei*, male: 41, Leg 2; 42, Leg 3; 43, Leg 4; 44, Leg 5 and anterior portion of urosome. Scales = 100  $\mu$ m.

with 1 long esthetasc on expanded article 4. Antenna (Fig. 38) with allobasis and exopod of 1 article bearing 4 setae. Mouthparts not examined except mandible which is prehensile (Fig. 39).

Swimming legs 1-4 (Figs. 40-43) each with exopod of 3 articles; endopods composed respectively of 3, 2, 3 and 1 articles. Setation formula for major armature as follows:

Leg 1	basis 1-1	exp 0-1; 1-1; 0,2,2
		enp 1-0; 1-0; 0,2,1
Leg 2	basis 0-1	exp 0-1; 1-1; 1,2,2
		enp 0-0; 2,0,0
Leg 3	basis 0-1	exp 0-1; 1-1; 2,2,1
		enp 1-0; -, -
Leg 4	basis 0-1	exp 0-1; 1-1; 2,2,2
		enp 1,2,0

Basal lamellae of legs 2 and 3 each with few hairs on anterior surface. Outer spines of articles 1 and 2 of exopod of leg 2 and of each article of exopod of leg 3 enlarged. Endopod of leg 3 modified, apophysis on article 2 reaching past midlength of article 3 of exopod, and article 3 with stout terminal

seta and acute terminal projection. Terminal article of exopod of leg 4 short and bent inwards; outer terminal seta short and stout, with clawlike teeth on outer distal margin.

Basipods of legs 5 (Figs. 34, 44) continuous and unornamented; exopods each with 3 setae of which innermost is longest. Posteroventral margin of first urosomal somite convolute; leg 6 consisting of 1 tiny hair.

*Etymology.*—Named in memory of Myron G. Radke, parasitologist and friend.

*Remarks.*—*Elaphoidella radkei* most resembles the Group VIII male tentatively assigned to *E. malayica* by Chappuis (1928). Chappuis' description of the endopod of leg 3 of this male says that it is similar to that of the previous species described (*E. bromeliaecola*), which implies that the first article lacks a seta. In addition to this possible difference in setation, *E. radkei* differs from the putative male of *E. malayica* in the number of teeth on the operculum and in possessing a total of five, not six spines and setae on the terminal article of the endopod of leg 2. Females of *E. malayica*, originally described from Java, have been reported



Table 1.—Some morphological features of neotropical species of the genus *Elaphoidella* belonging to Group VIII of Lang (1948); only one sex of several species has been described. VS, number of ventral spines on anal somite above each caudal ramus; IS, number of setae on inner surface of proximal article of endopod of leg 3.

Species	Feature		
	Operculum	VS	IS
<i>E. sewelli americana</i> (Chappuis, 1933), ♀	about 18 small teeth	3	0
<i>E. negroensis</i> Keifer, 1967, ♀	10–11 small teeth	3	0
<i>E. paraplesia</i> Keifer, 1967, ♀	9–14 small teeth	3	0
<i>E. humboldti</i> Löffler, 1963, ♂	fringed with fine hairs	5	0
<i>E. surinamensis</i> (Delachaux, 1924), ♀ and ♂	smooth	4	?
<i>E. malayica</i> (Chappuis, 1928) ♀	smooth	4–7	1
♂	6 teeth	4–7	0?
<i>E. suarezi</i> , new species, ♀	smooth	2	0
<i>E. radkei</i> , new species, ♂	8 teeth	4	1

recently from Martinique, French Antilles by Dussart (1982).

There is some ambiguity in Lang's diagnosis of Group VIII; the principal difference between this and the diagnosis of Group VII, which also includes several neotropical species, is that species of Group VIII are defined as having opercula which are smooth or with numerous short teeth, and that in males, the outer apical seta of the terminal article of the exopod of leg 4 is modified as a strong clawlike structure. In species of Group VII the opercula have several long, strong teeth, and in males, two outer distal setae of the terminal article of the exopod of leg 4 are modified. Apparently Lang ignored the long opercular teeth of the male of *E. malayica* in composing his diagnosis of Group VIII, with good reason since its identification with the female is tentative. I have placed *E. radkei* in Group VIII on the basis of the modification of only one exopodite seta on leg 4, as well as the presence of two, not three setae on the distal article of the endopod of leg 2. Unfortunately the extent and nature of sexual dimorphism in Group VIII are no better understood than in Lang's time, since only one sex of most species is known (Table 1). The opercula of males and females of *E. surinamensis* are similar.

#### Acknowledgments

I extend thanks to Dr. Marco F. Suarez for the gift of these specimens, and to Dr. Thomas E. Bowman for his comments on the manuscript.

#### Literature Cited

- Chappuis, P. A. 1928. Neue Harpacticiden aus Java.—*Treubia, Buitenzorg* 10(2–3):272–283.
- . 1933. Süß- und Brackwasser-Copepoden von Bonaire, Curaçao und Aruba.—*Zoologischer Jahrbuch (Systematik)* 64(3–5):391–404.
- Delachaux, T. 1924. Zur Kenntnis der Copepodenfauna von Surinam. II. Harpacticiden.—*Zoologischer Anzeiger* 59:1–16.
- Dussart, B. H. 1982. Copépodes des Antilles françaises.—*Revue d'Hydrobiologie Tropicale* 15: 313–324.
- Gurney, R. 1933. *British fresh-water Copepoda*, vol. III. The Ray Society, London, 384 pp.
- Kiefer, F. 1967. Neue Copepoda Harpacticoida aus dem Amazonasgebiet.—*Crustaceana* 13(1):114–122.
- Lang, K. 1948. *Monographie der Harpacticiden*, vols. I and II. Nordiska Bokhandeln, Stockholm, 1683 pp.
- Lindberg, K. 1958. Un Cyclopidé (Crustacé copépode) récolté par Monsieur Patrice Paulian dans l'île Amsterdam.—*Arkiv för Zoologi* 11:355–377.
- Löffler, H. 1963. Zur Ostrakoden- und Copepodenfauna Ekuadors.—*Archiv für Hydrobiologie* 59(2):196–234.
- Reid, J. W. 1985. Chave de identificação e lista de

referências bibliográficas para as espécies continentais sulamericanas de vida livre da ordem Cyclopoida (Crustacea, Copepoda).—Boletim de Zoologia, São Paulo 9:17–143.

Suarez, M. F., D. Ayala, M. J. Nelson, and J. W. Reid. 1984. Hallazgo de *Mesocyclops aspericornis* (Daday) (Copepoda: Cyclopidae) depredador de larvas de *Aedes aegypti* en Anapoima—Colombia.—Biomedica 4(2):74–76.

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